



## **Economics of forest and forest carbon projects. Translating lessons learned into national REDD+ implementation**

Technical summary

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# Economics of forest and forest carbon projects

**Translating lessons learned into  
national REDD+ implementation**



## TECHNICAL SUMMARY

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Lea Ravnkilde Møller  
Alexander Koch

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Villagers living around protected area. Holistic conservation Programme for Forests in Madagascar. Site of Andapa.  
Photo: WWF-Canon/M. Harvey

# Foreword

The financial implications of implementing a new forest management paradigm have not been well understood and have often been underestimated. Resource needs for instance for stakeholder consultation, capacity building and addressing the political economy are seldom fully accounted for in the resource needs estimates put forward in connection to REDD+. This report investigates the economics of implementing forest and forest carbon projects through eight case studies from Africa, Latin America and Asia, analyzing real forest and REDD+ investments.

The report is part of efforts to share financial experiences and lessons learned with policymakers, project developers and stakeholders, with the objective to inform forest project and strategy development. It presents experiences and advice on the risks, costs and revenues of forest projects, thereby informing not only the development of future REDD+ initiatives but also the testing of advanced market commitments as a finance option for sustainable forest management.

The findings in the report underline the fact that only through sound and transparent financial information will forest projects and national forest initiatives become interesting for private financial institutions and comparable with other investment opportunities. It is therefore important to include robust analysis of the operations business case and its financial attractiveness to commercial investors, early in the design process.



Sylvie Lemmet  
Director  
UNEP, Division of Technology,  
Industry and Economics (DTIE)

As for the economics of forest and forest carbon projects, it appears that REDD+ payments alone, especially at current prices, will not deliver the revenues that cover all expenses of transparent and long-term mitigation of forest carbon emissions. Instead the findings underline the importance of building up forest operations which effectively manages risk and delivers several revenue streams.

These findings are aligned with the advocacy efforts of UNEP and the UN-REDD Programme on multiple benefits and the combination of various funding and revenue streams. Only through this wider approach can our management and utilization of forest resources be ensured to deliver long-term benefits to national development, local livelihoods and climate change adaptation and mitigation efforts.

A transformation towards a low carbon green economy is also likely to present new market opportunities. While building on the traditional forest revenue streams (trade in timber and non-timber forest products) the emerging trade opportunities should also be included in the business model. As the demand for traditional forest goods is increasing and a green economy creates demands for new services, goods and solutions, it is foreseeable that with the right enabling conditions from the public sector, much more private sector investment will be directed towards forests in order to capitalize on a green economy.



Ibrahim Thiaw  
Director  
UNEP, Division for Environmental  
Policy Implementation (DEPI)

# Abbreviations

A/R	Afforestation/Reforestation
CSR	Corporate Social Responsibility / Corporate Sustainability and Responsibility
ERPA	Emission Reduction Purchase Agreement
FAO	Food and Agriculture Organization of the United Nations
GEF	Global Environment Facility
GHG	Green House Gases
HAP	Afforestation with Hazelnut Plantation in Western Georgia
HCPF	Holistic Conservation Programme for Forests
IFM	Improved Forest Management
IRR	Internal Rate of Return
JI	Joint Implementation
MPRP	Merang Pilot REDD+ Project
MRV	Monitoring, Reporting and Verification
NGO	Non-Governmental Organization
NPV	Net Present Value
ODA	Official Donor Assistance
OTC	Over-The-Counter
PDD	Project Design Document
PES	Payment for Environmental Services
PIN	Project Idea Note
REDD+	Reducing Emissions from Deforestation and forest Degradation in developing countries; and the role of conservation, sustainable management of forests and enhancement of forest carbon stocks in developing countries
VCS	Verified Carbon Standard
UNFCCC	United Nations Framework Convention on Climate Change
UNEP	United Nations Environment Programme
UN-REDD	The United Nations Collaborative Programme on Reducing Emissions from Deforestation and Forest Degradation in Developing Countries
URC	UNEP Risø Centre



# Executive summary

Since the Bali Action Plan in 2005, REDD+ has gained significant relevance as a financial mechanism to compensate countries for reducing their emissions from deforestation and forest degradation. This technical report is a shortened version of the full report “Economics of forests and forest carbon projects – Translating lessons learned into national REDD+ implementation”. The overarching aim is to advise policymakers and project developers on how to structure their REDD+ national strategies, especially those related to attracting private and/or public investments.

The report draws on the lessons learned from the analysis of eight forest carbon projects. The case-study projects that were selected for this report include private and publicly funded projects from Africa, Asia and Latin America. Access to finance and the high barrier of perceived risk are two of the most prominent challenges for the implementation of forest carbon projects, which will be addressed in the report. The study therefore evaluates the institutional roles, frameworks, agreements, and investment criteria which enabled project implementation, in order to identify the prerequisites for attracting investors.

The findings of the report aim to build the knowledge about costs related to forest project life cycles and the necessary institutional setup for the shaping of future national REDD+ strategies. The key findings of this report are:

1. Experience shows that public-private partnerships offer the most successful means to attracting investment and achieving sound project management, due to the fact that public investments facilitate the attraction of private investments.
2. National REDD+ programmes, instead of individual projects, offer the greatest potential to scale up investments in REDD+. By taking into account factors related to risks, costs and revenues, national REDD+ strategies would facilitate a positive environment for sustainable forest investment and thereby help to close the REDD+ financing gap.
3. To date revenues from carbon credits have been a secondary source of income for forest carbon projects. This is due to the volatility and immature state of the carbon markets. Therefore it is necessary to substantially increase the existing demand for REDD+ credits.
4. Financial analysis shows that forest carbon projects still do not represent attractive investment options for the private sector when compared to standard carbon projects. This is due to large investments that are required, and relative low rates of return. Evidence from the analysis of the case studies suggests that project developers need support to structure their financial proposals to secure funds. It is therefore necessary to develop international guidance on how costs and benefits can be quantified.
5. Financial risk is a major barrier to scaling up REDD+ initiatives. Most of the case study projects were financed through grants, as many are conducted on a pilot basis. This is mainly due to high financial risk associated with the projects, which increases the preferences of governmental and non-governmental organizations to give grants rather than loans. Moreover, this also reflects the reluctance of the private sector to engage in large investments due to high risk perception of the forest carbon projects.
6. Local community involvement, and the distribution of benefits at the local level, helps to secure a project's long term sustainability.

# 1. Introduction

Strategies to reduce CO<sub>2</sub> emissions from deforestation and forest degradation (REDD+) have gained significant momentum on the international climate change agenda. REDD+ provides an opportunity to create financial incentives for carbon storage and sequestration and consequently climate change mitigation along with co-benefits for local communities and biodiversity. In order to unleash this potential it is essential to address the question of how to effectively attract transformative private-sector and public-sector investments in sustainable forest management and REDD+. Large amounts of investment will be required and while public multilateral efforts are building readiness on the ground, private sector engagement continues to be reluctant due to high risks associated with forest projects. Furthermore, legal issues related to land tenure, forest ownership and carbon rights require much stronger influence from state governments through national legislation, which poses significant challenges for countries with weak governance capacity. Existing forest carbon activities

and REDD+ pilots are therefore pivotal for building experience and testing ways for a financial mechanism to reduce deforestation and transfer benefits to managing communities. Such emerging lessons and results will be critical for the successful development and implementation of national REDD+ strategies.

The aim of the report is to advise policymakers and project developers on how to structure their REDD+ national strategies, especially those related to attracting private and/or public investments. In line with the objective, this study set out to draw lessons from eight carbon forest projects, based on their institutional structure and financial aspects including risks and community benefits. The diversity of the projects demonstrated in itself the many ways and opportunities that REDD+ presents to the forest sector and communities in developing countries. The analysis is primarily based on data collected from forest carbon project developers and covers private, public and a combination of private-public financed projects.



## 2. Background

### Readiness for national REDD+ strategies: testing REDD+ implementation

National REDD+ programmes, instead of individual projects, offer the greatest potential to scale up investment in REDD+. Therefore, national REDD+ strategies could empower the financial, technical and regulatory frameworks that can facilitate and accelerate incentives to secure the funds needed for the implementation of REDD+ programmes at sub-national level.

Nevertheless, REDD+ activities at the project level will be important, not only because of expected synergies of the work at different levels, but also because deforestation will often need to be addressed locally. The real-world success factors and challenges of forest carbon projects can therefore play an important role in informing the development of national strategies, thereby ultimately increasing their effectiveness. The functioning of national strategies, in turn, can be tested on the ground at the project level. What are the right conditions to attract project financing? What are the risks, costs and revenues linked to delivering REDD+? By taking these and other factors into account, national REDD+ strategies could facilitate a positive environment for sustainable forest investment, especially the private one and thus help close the REDD+ financial gap.

### Financing forest carbon activities

Funding for forest carbon projects in developing countries flows mainly from three sources: i) public funds; ii) private investments; and iii) a mixture of public and private funds. Public funding should aim at establishing institutions and implementing a number of activities to attract private sector investments in forests and REDD+. With regards to private investments, if engagement is sufficiently attractive and the risks can be effectively mitigated or avoided, the private sector would be more likely to invest in REDD+. Combining public and private funds could reduce the high risks that private investors perceives and could help to engage this sector. A longer explanation can be found in the full report “Economics of forest and carbon forest projects”

### 3. Introduction to selected case studies

The following section presents a brief description of the eight selected case studies. The full description of the case studies can be found in the full report “Economics of forest and carbon forest projects”).

#### Case Project 1: Asiyila Gum A/R CDM Project (Senegal)

Case Project 1 is a reforestation on degraded lands project. The objective of project is to plant gum trees (*Acacia senegal*) on more than 20,000 hectares of degraded land in the Sahelian zone of Senegal. The project aims to increase the Arabic gum production in Senegal as well as promote ecosystem rehabilitation through reforestation efforts. The project is expected to contribute to the export of Arabic gum, which has been identified as a strategic area of economic development by the Senegalese government. The project is estimated to sequester 715.895 tCO<sub>2</sub>e in total over a 30 year crediting period (PDD (1), 2010).

#### Case Project 2: Ibi Batéké Forestry Carbon Sink (Democratic Republic of Congo)

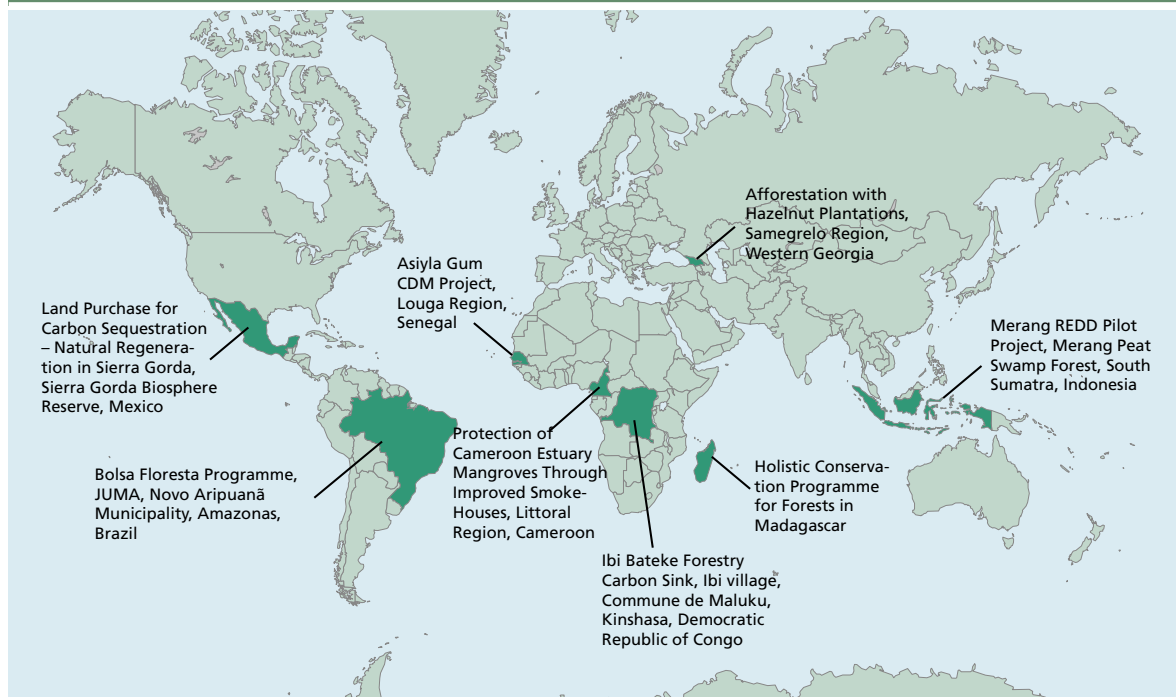
The Ibi Batéké Forestry Carbon Sink is an A/R CDM project aimed at converting 4,220 hectares of degraded savannah land into forest plantations for sustainable fuelwood supply and agricultural crops. The project is located on the Batéké plateau in the Democratic Republic of Congo and is implemented by NOVACEL, a private company founded and managed by natives of the region. It offers an opportunity to reduce degradation and deforestation while alleviating poverty through local employment and community development activities. Afforestation and subsequent CO<sub>2</sub> sequestration allows the project to generate carbon credits of both CDM and VCS standard. ERPA's have been signed with the World Bank's BioCarbon Fund for the purchase of 500,000 CERs to be generated by 2017 as well as with the French company Orbeo and Danone (PDD(2), 2010). Carbon credits have provided benefits to the communities and the project is considered an integral part of a local sustainable development strategy in the Democratic Republic of Congo (Topa, 2009).

#### Case Project 3: Protection of Cameroon estuary mangroves through improved smoke houses (Cameroon)

The project is aimed at promoting sustainable utilization, management and conservation of the Cameroon mangrove ecosystems as fisheries support systems and buffers against climate change impacts. Fish smoking and fish processing activities are one of the main drivers of degradation and loss of mangroves in the region. The project consists of significantly improving traditional smoke houses, thereby helping local communities to smoke fish in a more efficient way. As the smoke houses are mainly fuelled by mangrove wood, the improved technology also reduces the pressure on the unmanaged mangrove wood resources by indirectly reducing deforestation and degradation of the Douala-Edea mangrove forest. The project will be implemented in nine villages located near the mangrove area before 2014 (PDD (3), 2010). The whole project activity is expected to sequester 90,234 tonnes of CO<sub>2</sub>e during the 10 years crediting period (2010-2020) under the CDM (CASCADe, 2010).

#### Case Project 4: The Holistic Conservation Programme for Forests (Madagascar)

The Holistic Conservation Programme for Forests (HCPF) is a REDD+ pilot project initiated in 2008 which is contributing to the development of the national REDD+ strategy for Madagascar. Its main goals include improving knowledge on strategies to reduce GHG emissions, increasing the living conditions of local communities and fully integrating biodiversity conservation. The project, which covers an area of more than 500,000 hectares, is fully financed by the French Foundation GoodPlanet, with Air France as the sole sponsor, and is implemented in the field by WWF Madagascar (BasicQuestionnaire(4), 2011). It has been funded as a grant scheme to avoid any risks related to non-delivery of carbon credits. The project developers are therefore not currently considering selling any potential carbon credits generated from the activities. Instead, the project is oriented towards

**FIG. 1** | Overview of the geographical locations of the eight forest carbon projects selected for the study

testing research options and developing a forest carbon methodology for Malagasy forests.

#### **Case Project 5: Afforestation with hazelnut plantations in Western Georgia (Georgia)**

The objective of the project is to sequester carbon and halt ongoing degradation of abandoned tea plantations in the poor rural Samegrelo region near the Black Sea coast, Georgia, through sustainable forest plantation with hazelnut (PDD (5), 2011). The region where the project is implemented has excellent economic potential, however investment is currently hampered by political instability and armed conflict risks. After the collapse of the Soviet Union, the Samegrelo region was left with a lack of capacity, deteriorating infrastructure and uncertain land tenure issues. This led to land abandonment, slash and burn clearing for grazing and small-scale crop cultivation, deforestation and illegal waste dumping, and low investment in agricultural

projects. The project offers significant environmental and economic prospects, including much needed sustainable and long-term income opportunities for local communities (BasicQuestionnaire(5), 2011). The project, which is managed by Agrigeorgia LLC, has a total eligible planting area of 2401 hectares plus an additional 250 hectares of nature conservation. The total avoided/sequestered CO<sub>2</sub> will amount to 550,272 tCO<sub>2</sub>e over an accounting period of 50 years (TÜV SÜD Industrie Service GmbH, 2011).

#### **Case Project 6: Merang Pilot REDD+ Project (MPRP) (Indonesia)**

The Merang REDD Pilot Project (MRPP) aims at identifying opportunities to reduce greenhouse gas emissions and protect biodiversity through avoided deforestation and degradation in South Sumatra, Indonesia. The project zone, which covers an area of 24,000 hectares, comprises the largest remaining peat swamp forest in

South Sumatra, contributing to large below-ground carbon storage in the peat. However, the forest is currently under great pressure from illegal logging, forest fires and the conversion of peat swamp into intensive palm oil, pulp and paper plantations. The German Federal Environment Ministry (BMU) has committed to financing the project as a grant scheme. The carbon sequestration will be running over a period of 25 years and could potentially save about 400,000 tonnes of CO<sub>2</sub>e/year.

### **Case Project 7: Juma Sustainable Development Reserve Project (Brazil)**

The Juma Sustainable Development Reserve Project aims at addressing deforestation in the south-eastern part of Amazonas State, Brazil, an area which is currently under great pressure from land use conversion. Its implementation is part of a wider strategy initiated and planned by the government of Amazonas State to halt deforestation and promote sustainable development. The project is being implemented by Amazonas Sustainable Foundation (FAS) with financial support from the Amazonas State Government, Bradesco Bank, Coca Cola Brazil and Marriot International. The accounting period of the project will run from 2006-2050, and seeks to prevent deforestation of 329,483 hectares of tropical forests, corresponding to an avoided emission of 189,767,027 tonnes of CO<sub>2</sub>. The project has been validated under the Climate, Community and Biodiversity Alliance (CCBA) Certification with the award of a Gold Quality Standard (BasicQuestionnaire(7), 2011).

### **Case Project 8: Carbon Sequestration in Communities of Extreme Poverty in the Sierra Gorda of Mexico (Mexico)**

The Sierra Gorda Biosphere Reserve (SGBR) is a reforestation and carbon forest project aimed at sequestering carbon in local ecosystems and avoiding future deforestation and biodiversity loss while promoting sustainable development at a community level. The reserve, which was created in 1997, covers an area of 383,567 hectares and is located in the north of Queretaro State, Mexico. The project is managed by the NGO Bosque Sustentable A.C together with Grupo Ecológico Sierra Gorda IAP. The sustainability of the project is ensured through payment for ecosystem services schemes established by CONAFOR (the National Forestry Commission), with funding from the World Bank Development Marketplace and Fundación Gonzalo Río (In-depthSurvey(8), 2011). The project aims to reforest areas that were deforested prior to 1990 (PDD (8), 2010) as well as to provide alternative income to landowners living in extreme poverty. The project represents a living model of community-based conservation management where residents, who own 97 per cent of the territory, and have over the last 25 years received training and actively participated in restoration and productive development (Sierra Gorda Ecological Group).



## 4. Institutional setup

The design of forest carbon projects depends on the particular economic and legal systems in which the project operates, e.g. national policy priorities, existing institutions and availability of resources, and how the project has decided to elaborate their strategies and implementation frameworks are matters of choice and sovereignty of the project developers and owners.

### Stakeholders involved

The diverse range of stakeholders involved in each of the case projects shows that there are several ways to implement forest carbon projects and REDD+ activities. These range from small-scale projects with relatively few stakeholders to larger institutional arrangements that have engaged a much wider group of stakeholders. While the involvement of a larger number of stakeholders might complicate the institutional set-up and increase transaction costs, such projects are likely to receive more visibility and opportunities to attract investors and carbon credit buyers. Besides the stakeholders who are directly involved in the case projects, a number of external actors such as public authorities contribute to the framework in which the projects operate. This could be policies on collaborative forest management agreements or environmental policies. External actors provide links to policies and processes that may affect the deliverables and efficiency of projects. Stakeholders may include local environmental officers managing impact assessments or district agricultural officers managing adjacent lands. For many of the projects universities and institutions also provide significant technical support, e.g. for developing methodologies, land-use modeling, carbon assessment software and the provision of high resolution satellite images.

To have more information about the specific institutional details of the case studies, please visit the full report “Economics of forest and carbon forest projects”

### The extent of involvement and role of local communities

The involvement of communities, in the forest carbon case projects, has helped to lower the cost of forest carbon sequestration and storage. Typically, labor and administrative costs paid to communities are lower in comparison to what is paid to forest departments governing forests for similar kinds of work efforts (Somathan et al., 2009).

Generally, for the projects reviewed in this study, communities are involved both directly through employment opportunities and indirectly through community development activities. Local community involvement and the distribution of benefits at local level help to secure a project's long-term sustainability. Most of the case projects were designed through a transparent process which included participatory workshops and policy consultations to guarantee the involvement and commitment of all the local stakeholders. Additionally, most of the projects have an office located within the project area and a project field coordinator. Besides a greater transparency for involved participants, such measures also have the potential to lower transaction costs and ensure efficiency with decisions rooted in the local specificities and conditions.

Experience shows that it is also important to establish a solid and participatory mechanism to redistribute project income to local stakeholders and communities involved in forest carbon projects or programmes. Part of the income generated by forest carbon projects are, in most cases, allocated as payments for environmental services to the participating communities. These payments subsequently turns into concrete and direct benefits including access to clean water, healthcare, information, productive activities and other welfare improvements for the participating communities.

### Establishing a relationship: the projects, their clients, investors and other partners

An important turning point for a forest carbon project is the capacity to secure funding. Besides the development of business plans containing descriptions of a project's profitability and risk profile, which will be analyzed by potential investors, the projects need to establish the initial contact with investors. In addition, the analysed projects identified investors which were buyers of potential carbon credits, timber and forest products, etc. The project financiers included both individual financing schemes through a single investor and financing schemes involving groups of several investors. Additional project financing was shown to be provided through bank loans, public funds in the form of subsidies or grants, or private sources such as donations.

A few of the case projects analyzed were entirely financed and managed by private companies, others were organized as part of a company's CSR strategy and some were set up through a public-private partnership. Due to the risks and complexities surrounding REDD+ activities (land tenure, user rights etc.), public-private finance schemes are in many cases preferable, as the private sector is more likely to engage in projects that have already received funding from a bi- or multilateral funds. Such projects will also stand a better chance of being transitioned into future national REDD+ strategies or programmes as well as MRV and national baselines. Altogether this increases their attractiveness to investors.

There is generally a need for platforms that provide networking opportunities for investors and project developers, especially at a national level. Regional carbon forums, which were originally focused on capacity building for CDM and standard carbon projects, have since evolved to a much larger spectrum including forestry, agriculture and REDD+. However, in the light of the current state of the carbon market, forest carbon projects tend to be overlooked by investors when compared to other carbon activities from, for example, the energy sector. Multilateral organizations in collaboration with national entities should therefore aim to facilitate forums that target investors and project developers from the forestry sector and should be organized at a national level.



## 5. The current financial situation of forest carbon projects and their financial attractiveness

Financial indicators like Net Present Value (NPV) and Internal Rate of Return (IRR) determine the attractiveness of a project because they allow the investor to compare different available investment options. They determine why investors make the decision to invest in one or the other project.

A detailed definition of the financial indicators (NPV, IRR and discount rate) along with other investment rules can be found in the full report “Economics of forest and carbon forest projects”

### Analysis of the current financial situation of the case studies

This analysis has not done a direct comparison between the case study projects because their sizes, length and levels of risk vary and their discount rates are not the same whereas only NPVs and IRRs from projects with

similar conditions, namely life spans, discount rates and initial investments, can be compared.

### Financial structure

Most projects are financed through grants, but since they are neither debt nor equity, they cannot be classified into either of these two types. According to UNEP Risoe Centre (2007), the financial structure of a project changes as it moves through its different stages. The planning phase is considered to have the highest levels of risk and is, as a consequence, mostly financed through grants and equity. The construction phase, with moderate risk, is financed through debt and equity. This is usually due to the fact that lenders, such as financial institutions, are reluctant to give loans for investments with high levels of risk (UNEP Risoe Centre, 2007). Table 1 gives an overview of the financing sources of all the projects that were analyzed in this report.

**TABLE 1** | Source and amount of finance of all case projects

Project	Source	Name of source	Amount
Asiyla Gum	Private investor	Asiyla Gum SARL	US\$ 7,560,000
Ibi Batéké	Private investors	Novacel, Suez, Umicore	€ 31,390,000
CWCS	Private investors	No information	€ 105,000
HCPF	Grant scheme	Air France	€ 4,482,061
HAP	Private investor	Ferrero Spa	Confidential
Merang	Grant scheme	BMU	€ 2,096,959
Juma	Private investors and grant	FAS, Bradesco Bank, Coca Cola Company, Marriot International	US\$ 41,392,425
Sierra Gorda	Grant	Mexican government	US\$ 391,544

Source: project in-depth surveys and PDDs

**TABLE 2** | Financing sources for Case Project 7

Financiers/investors	Total amounts	Proportion
Reinvested income from project	US\$ 38,142,425	92%
Grant	US\$ 2,000,000	5%
Project developer equity	US\$ 1,250,000	3%
Total	US\$ 41,392,425	100%

Source: Juma in-depth survey

**TABLE 3** | Changes in financing sources for Case Project 7

Financiers/investors	Planning phase	Implementation phase	Operational phase
Reinvested income from project	0%	93%	93%
Grant	15%	7%	0%
Project developer equity	85%	0%	7%
Total	100%	100%	100%

Source: Juma in-depth survey

### Case Project 7: Juma Sustainable Development Reserve Project Brazil

It has received funds from the Amazonas State Government and Bradesco Bank to cover part of the first phase costs. Furthermore, the Marriott International hotel chain is financing the first four years' running expenses of the project (2008-2012) with USD \$2 million (See Table 2).

As Table 3 shows, equity and grant financing play a large role in the first phase of the project. However this changes in the implementation phase where reinvested capital from generated income becomes the predominant source with 93 per cent. Additional detailed information on the financial structure of Case Project 2 and 3 can be found in the full report.

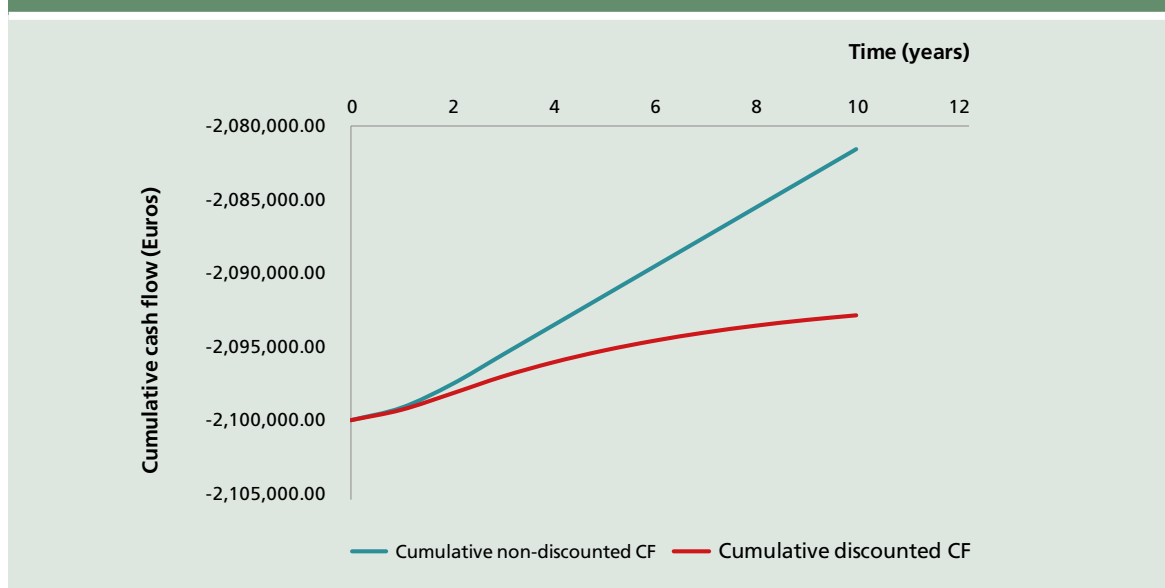
Most of the case study projects are financed through grants. This is mainly due to the fact that many are conducted as pilot projects which are associated with high-risk. It furthermore reflects the reluctance of the private sector to get engaged with large investments due to the high-risk perception. Companies fund such projects as part of their corporate social responsibility programmes, not as part of their investment portfolio because the impact of investing in forestry projects and CSR projects are generally very difficult to quantify in monetary terms. The fact that carbon credits achieved from REDD+ projects are excluded in most markets, such as the EU ETS, makes it even more difficult to engage the private sector in this area.

**TABLE 4** | Case projects' financial indicators

Project name	NPV	Discount rate	IRR	Duration of the project
Ibi Bateke	€ 70	20%	-	20 years
Juma	€ 30,020,578*	2%	46%	44 years
Asiyla	-	-	9%	30 years

\* Exchange rate: 1USD = 0,725€ from the 08.11.2011

Source: Case projects' in-depth surveys

**FIG. 2** | Cumulative cash flows for Case Project 6

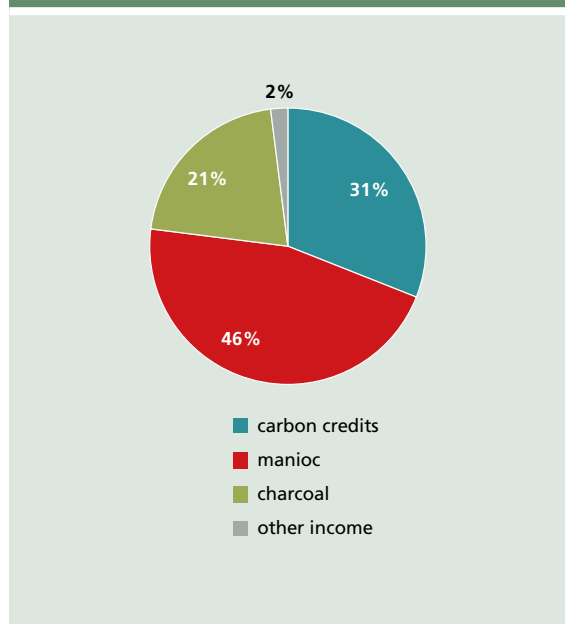
Source: Merang (2010)

### Financial indicators

All case study project managers were asked to fill out a survey which included a section on financial data. They were asked to provide information on forecasted yearly cash flows, the lifetime of the project, NPVs, discount rates and IRRs. Only a few projects were able to give part of the information that was requested with most providing incomplete data either because it was confidential or it was not estimated or calculated. In some

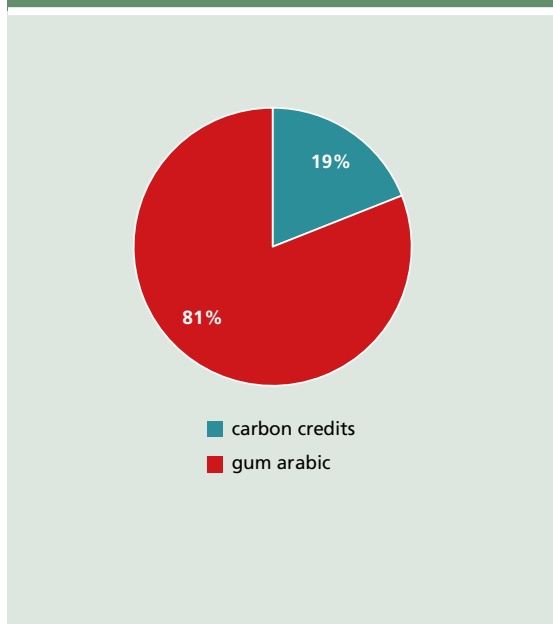
cases, knowledge about the percentages of revenue from the different activities was missing, which makes it understandably difficult to estimate cash flows and subsequent financial indicators. Due to the difficulty and complexity of estimating financial indicators for forest carbon projects, many companies prefer to give charity funds to environmental projects as part of their CSR programmes, without expecting any positive return.

**FIG. 3** | Case Project 2's sources of revenue



Source: Chenost & Mushiete (2011)

**FIG. 4** | Case Project 1's sources of revenue



Source: CASCADe (2007-2010)

All project managers should calculate the financial indicators for their projects. Annex 2 and section 4.2.2. of the full report provide examples and more information on how to calculate these financial indicators. Table 4 shows data for the projects, which provided some information regarding NPV, discount rate, IRR and duration period. The differences in size are considerable. This is due to the fact that these projects vary in regard to overall project volume, discount rates used and project lifetime.

The curves in Figure 2 track the cumulative cash flows and discounted cumulative cash flows for Case Project 6 on a yearly basis. This means that all discounted cash flows at the point of each year are accumulated (summed together). The blue line indicates the cumulative cash flow without discounting it back to the present, which is why it will pass the x-axis faster than the red line. The problem though is that it does not reflect the benefits in terms of money today and therefore

does not account for the opportunity cost of capital. However it is included in the graph to illustrate the difference such an error would make in the real breakeven point. The red line instead traces the discounted cumulative cash flow, reflecting "real" benefits. A further example for Case Project 2 can be found in chapter 4 of the full report.

Most of the case studies show that the projects are conducted on a pilot basis. Additionally, most projects expect to add other activities during the passing of the time which were not considered at the beginning and therefore were not counted into the calculation of the project's initial financial data. Average, non-forest projects have a clear boundary and specification of their activity scope, so it is possible to calculate their finances from the beginning when searching for investors. Since there is no clear boundary of activities in forest carbon projects, as most of the case studies show, it is difficult for the project managers to calculate how much capital



they will need over the lifetime of the project and how much revenue they can generate. Capital requirements and revenue are preliminary estimates and make it more difficult for the investor to get a clear picture of the project and ascertain whether it represents an attractive investment opportunity or not.

### **Carbon credit revenue**

The activity of generating carbon credits is used by all of the case study projects except Case Project 4, which is currently not planning to generate carbon credits. Carbon credits are a support activity to get additional revenue, and are not normally the core source of revenue. Two examples are provided below:

Carbon credits are used as an additional and not as a main revenue-source activity as it is shown for the case projects 1 and 2 (Figures 3 and 4) in which the carbon revenues account for 19% and 31% respectively. The major source of revenue for these projects are generated through the sale of commodities. This is due to the fact that carbon markets are not yet considered to be fully established markets, risk is high and prices are still very low. On the other hand, many investors might be attracted to the project because it includes a REDD+ initiative. A global agreement on carbon emissions and carbon pricing would largely benefit the development of carbon markets, especially for the REDD+ component. Other projects, for instance Case Project 7, aim at receiving revenues from the sale of CERs only. The additional income that is generated by the local communities under the project through sustainable activities remains with the community.

### **Comparing the case study forest carbon projects to standard projects**

The comparison, although important, is limited because of the different conditions of the projects like discount rates, size and lifetime among others. A superficial comparison between the time it takes for the two types of projects to recuperate their investments and earn real benefits yielded some common characteristics of forest carbon projects. They usually require large initial investments in relation to the returns that are generated. Additionally, it takes a long time before any return

is achieved. Illustrative graphs can be found in the full report. These elements make it even more difficult to improve the financial attractiveness and widen the gap between standard projects and forest carbon projects.

### **Scenarios for forest carbon projects**

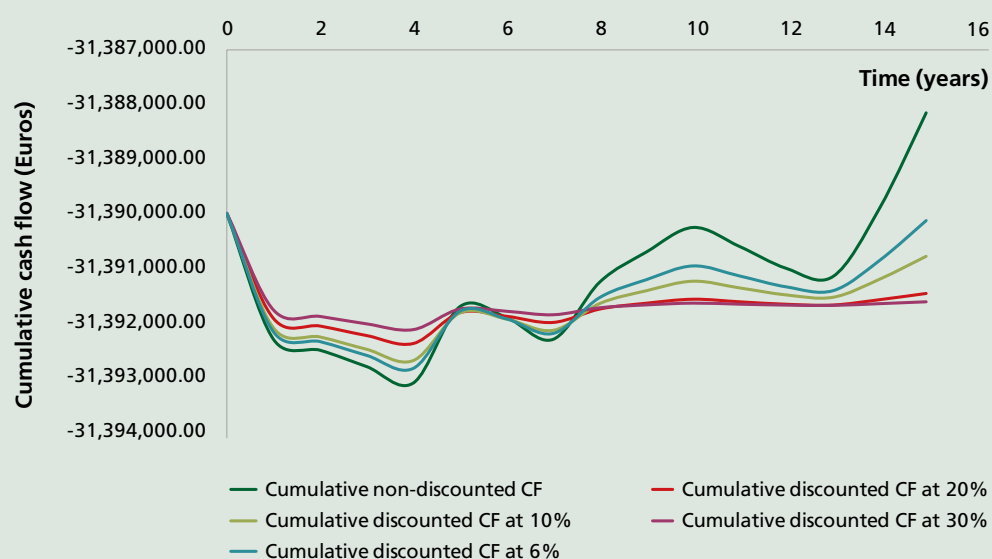
In figure 5 various discount rate scenarios for Case Project 2 are represented. The figure demonstrates that the higher the discount rate, the flatter the curve and the longer time it takes for the curve to cross the x-axis. Projects with high risk or which investors perceive as risky generally have a higher discount rate than less risky ones. The use of a higher discount rate indicates that the capital invested is more valuable now than in the years ahead because there is substantial uncertainty about getting it back. Box 5 in the full report shows some ways in which investors assess a project's risk and how it affects its NPV and IRR. Therefore, the higher the discount rate the more time it will take for the project to cover its investment and generate positive returns for its investors.

Reducing risk and thereby reducing the discount rate will improve the financial indicators of a project and increase the likelihood of a positive NPV and a shorter amount of time until real returns are expected. This is generally true for any project, not only forest carbon projects. However, since forest carbon projects are associated with high levels of risk, it is even more important for them to take action to mitigate their risk.

### **Scenarios for carbon credit revenue**

Carbon credit prices are very volatile (World Bank, 2012). They depend not only on supply and demand but also on macroeconomic factors like political agreements. Carbon credit prices influence the revenue for forest carbon projects and are therefore important to increase their financial attractiveness. If the forest carbon project is able to sell its carbon credits at higher prices on the market, the revenue and therefore their financial situation will improve. The cash flows would be higher and the NPV and IRR would also be higher.

The revenue from REDD+ initiatives should be sufficient to persuade local communities to engage in them

**FIG. 5** | Cumulative cash flows with different discount rates for Case Project 2

Source: Chenost &amp; Mushiete (2011)

meaning that REDD+ revenue should be at least the same as the revenue that they could earn from other activities. Otherwise it would be more profitable for them to pursue other alternatives that may be destructive to forests.

To provide practical examples of the impact of the carbon price, a low (€ 3.00), average (€ 5.00) and high (€ 8.00) price were used to calculate the different scenarios for each of the eight projects. The prices were picked based on the current index carbon price which lies around €6.98 per tonne (May 2012).

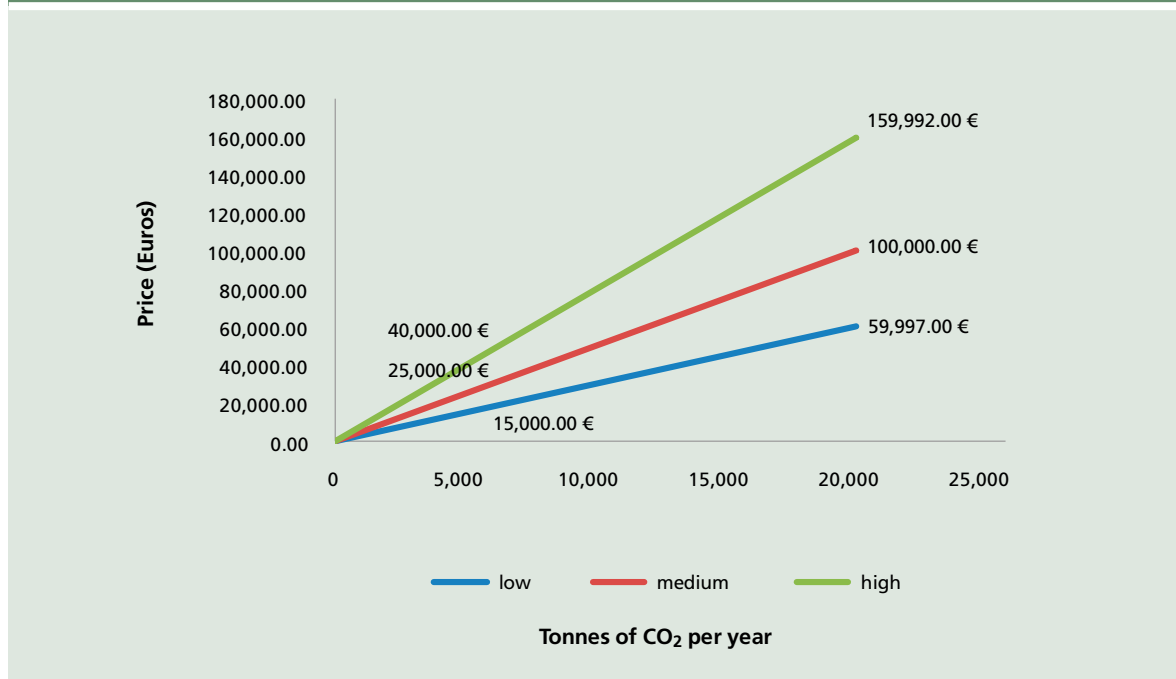
Figure 6 shows the difference in revenue scenarios for carbon credits generated from Case Project 5. Each line represents one of the scenarios: low, middle and high prices for a tonne of CO<sub>2</sub>. The lines furthermore show that the revenue made also depends on the quantity

of credits that the project can generate. As the exact tonnes of emission reduction units will vary from year to year, the quantity of credits that can be sold will change, resulting in a variation in the revenue.

#### Where do the financial problems lie

Essentially, what forest carbon projects need to become financially attractive is to reduce the risk-adjusted discount rate by reducing risk. In the section of risk, a detailed explanation of the effects of risk on a project's attractiveness is presented and the ways to reduce risk are indicated.

Due to the current high risk, forest carbon projects that pair a carbon credit activity or another REDD+ activity with another business activity that can be profitable on its own will increase their probability of success and thereby reduce the perceived risk. National govern-

**FIG. 6** | Revenue from carbon price scenarios for Case Project 5

Source: HAP in-depth survey

ments, including at the local level, can also help decrease the perceived risk by putting specific regulations and financial mechanisms into place to enable conditions to protect investments. It would increase the confidence of investors that invest in forest carbon projects to recover their capital. This is positively illustrated by the Amazonas Sustainable Fund (FAS) that was created by the Brazilian state of Amazonia. A more detailed illustration on how FAS works will be provided in the risk section of the publication.

The REDD+ activity is used to broaden and increase the revenue for a project thereby also decreasing the risk and dependence on one single revenue stream. The main activity, however, is expected to generate most of the revenue. If this activity fails to deliver, the project has a high probability of failure. The purpose of the main activity is to provide more security to make the investor

less worried about losing his/her investment. This is a major lesson learned. The examples from the case studies that are provided in section 5.4.2 in the full report and under section 6 here illustrate this point.

Alternatively, forest carbon projects require higher carbon prices than are currently present in the market. This requires more stringent policies towards emissions. To increase carbon prices, it would be necessary that governments put regulations in place that make carbon emissions expensive, not only on a national level, but globally. Only then will companies see that they can benefit from making carbon-reducing investments (Reinhardt, 2007). This action would be a large step towards making REDD+ and other carbon-reducing projects more attractive and profitable. The higher price would work as an incentive to invest in carbon credits and forest carbon projects.

## 6. The role of risk in project financing

Risk is a key element in investment decisions and plays a decisive role in whether a project is able to attract investors or not. It is therefore necessary to take a closer look at this issue and to clarify what risk actually is, how it affects investment decisions of the private sector and how projects can reduce specific risks to become financially attractive. For the sake of the analysis, this section treats the carbon market/REDD+ market as an already-developed generic market. However, what needs to be kept in mind is that it actually is a fairly new market which is voluntary, has not yet reached maturity and its development is still in the first stages.

Risk is generally defined as any event that may sabotage the profitability and success of a project (Roberts, 2007). This definition provided by Roberts (2007) will be referred to throughout the text.

### Prominent risks identified by forest carbon projects

Project managers were asked to rank risks according to which they thought were most prominent in their projects. The figure 7 shows a ranking of the most commonly identified risks.

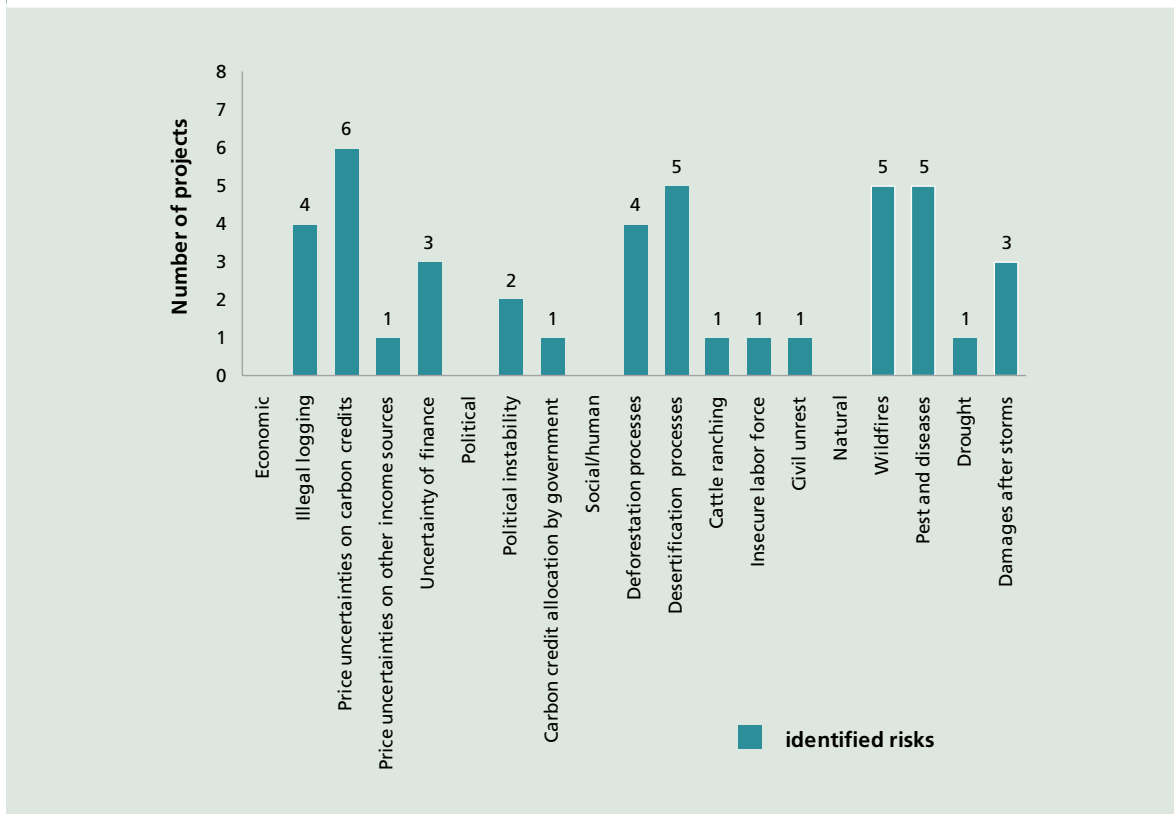
The figure suggests that mostly natural risks and risks that could potentially reduce the area used for carbon credit creation are considered most threatening. The highest consensus was found regarding risks of price changes of carbon credits. This supports the overall point of view of this report that carbon markets are still not established and mature. Before private investors will actively engage in providing more financing for REDD+ initiatives, carbon markets need to be successfully established and reach a "mature" state. Only in this way can price uncertainties be significantly reduced to a level that is common for other established markets. A global agreement, under the UNFCCC, could create a commitment arena and genuine emission-reduction pledges, especially from developed countries. This will have the potential to unleash offset mechanisms such as carbon markets or other types of REDD+ crediting mechanisms.

### How the risk around forest carbon investments can be reduced

States and governments should review and establish national policies to protect their forest areas. Strong regulations should be put in place to ensure sustainable forest management and conservation. Emphasis on implementation and especially policy enforcement is imperative in order to be successful. Development aid organizations should cooperate with national and local governments, channeling their funds to activities which deliver improvements in the investment environment and thereby reduce the perceived risk. It is of utmost importance to make sure that policies, regulations, and incentives are aligned across sectors, because ambiguous or contradicting policies can undermine the effort (Brohé et al, 2009; Rao, 2000).

Grant donors and investors can use some risk reducing strategies as well. Donors could establish and demand requirements for fund eligibility of a country. A certain amount of the funds can specifically be directed at risk-reducing actions that are specified beforehand. In order to reduce the misuse of funds, donors and investors can conduct periodic controls such as monitoring and auditing, demanding detailed reports stating what the funds have been used for. Additionally, governance reports can be demanded as a prerequisite for countries and projects to be eligible for funds.

Although it is necessary to establish a global and clear agreement on carbon trading to reduce carbon market risk and forest carbon project risk, it will take time for politicians to agree on appropriate policies. Instead, large companies have the funds to act now. Many of them have realized that they might gain an advantage by engaging in carbon reducing activities and supporting forest carbon projects. Or at least many have recognized that it will not hurt them to engage in such activities, rather it would be harmful not to do anything because of public pressure. However forest carbon projects are not the only way for companies to become "carbon neutral". Increasing energy efficiency, promot-

**FIG. 7** | Identified risks by project developers from the case studies participating in the publication

Source: Data from all in-depth surveys

ing clean technologies and recycling materials are some examples which compete with forest carbon projects.

#### Tools to reduce project-specific risk

Project developers need to calculate risks concerning their projects. The analyzed case studies below provide examples of some risk management options. More information on effective risk management can be found in the full report.

#### Examples from case studies

##### Case Project 5

Case project 5 combined an existing profitable activity with REDD+ activities. This project in Georgia relies on two activities to generate revenue, a commodity, ha-

zelnuts, being the main source of revenue and carbon credits as the secondary source.

The main business for Case Project 5 is the production of hazelnuts for a private company. Thus the project has a secure buyer of its commodity, thereby reducing revenue associated risk. Furthermore, the business of hazelnuts has lower risk than others because the price is relatively stable. Then the decision was taken to combine this business with carbon credits as an additional source of revenue, stemming from the increase in biomass. Risk is then only or mostly associated with carbon credit revenue where the price is volatile. Risk was reduced by relying on a low-risk main activity with a secure buyer and supporting it with a REDD+ activity.

## Case Project 7

Case Project 7 identified its risks and consequently developed a risk mitigation plan. This plan lays down all actions necessary to mitigate each identified risk. Deforestation monitoring, control activities and a buffer of 10 per cent of the carbon stocks exemplify some of the measures taken. The buffer was created as part of an investment risk-management strategy and was based on the risk assessment of the Voluntary Carbon Standard (VCS). Furthermore, to secure the necessary flow of resources after the crediting period, the aim is to set up a permanent fund (Juma PDD, 2009). Although this fund is partially secured by the Amazon Fund, 90 per cent of the project's financial resources from FAS (Amazonas Sustainable Foundation) come from the private sector, e.g. Marriott International, Samsung and Coca-Cola Brazil (In-depth-Survey(7)). Some project components are secured through a contribution that the Amazon Fund is making to the Bolsa Floresta Programme. Additionally the Bradesco Bank channels the funds and acts as a third party, assuming responsibility for repayment.

The direct involvement of the local Amazonas State Government and the Amazon Fund, which is managed by the Brazilian Development Bank (BNDES), not only decreases the risk that investors perceive but secures active engagement of the local communities. A local government instead of a national government usually has a larger implementation power and enjoys more trust due to its closeness to the local communities. The project directly benefits local communities as they receive part of the project's income and other benefits like healthcare and education. This encourages their further involvement and commitment, securing a sustainable long-term effort. Case Project 7's business model illustrates the concept of embedded innovation from Simanis and Hart (2009) that relies on the co-creation process together with the community to create a new business. Co-creation creates trust, which is of the utmost importance to the success of the project.

In conclusion, Case Project 7's success did not only come from engaging in activities mostly with carbon credit revenues but from its unique business model that is designed to reduce investor risk and creates adds devel-

opment value for communities that are committing to "zero deforestation".

## Final considerations regarding risk

From the previous discussion about risk it has become clear that forest carbon projects are being constrained by major barriers to attract financing from the private sector. In order for them to move from a "new type of business" to being recognized as standard projects, ways for overcoming these barriers need to be found. In section 5.3 of the full report, tools for risk reduction are addressed. However, first it is necessary to understand what each barrier entails and why it presents a major problem for forest carbon projects. In the following part, each barrier will be discussed in detail.

## Main barriers to finance

Throughout the section and from the conducted case studies, the following three barriers to finance for forest carbon projects have been identified: 1) project risk barrier, 2) carbon market risk barrier and 3) the barrier caused by higher performance of substitute activities.

## Project risk barrier

Forest carbon projects are characterized by high levels of risk, which makes them unattractive for private investors, especially risk averse investors. Their fear of losing their investments will usually scare them away from this type of project and others will demand a high rate of return as compensation. Most private investors have so far funded forest carbon projects for Corporate Social Responsibility (CSR) purposes, without real return expectations. Many other companies fund forest carbon projects in the hopes of reducing their carbon footprint and thereby avoiding penalization from governments. But the long-term purpose should be to attract private investors because forest carbon projects are profitable opportunities, and not charity, or "green-washing" opportunities. These tools were not provided in this short version but in the full report in section 5.3 and rethinking the business model of a project could certainly reduce project specific risk to overcome this barrier. That should be the first step in moving towards financial attractiveness.



**Market risk barrier**

New markets, like in this case the carbon market, are subject to risk. However all markets, new or established, are exposed to risk. Of course, new markets have higher risks than mature markets but project managers and investors cannot control them. This market risk needs to be understood as a macroeconomic risk, that is, a risk coming from the overall economy. Diversification strategies can therefore only reduce project specific risks, not market risks, because they depend on many complex factors arising in the external environment. The fact that carbon market risk is higher than risks affecting established markets constitutes a barrier for capital competition with similar conditions.

Creating policies to develop carbon markets and/or REDD+ crediting mechanisms and providing incentives for the private sector to engage to help them move towards a mature state will considerably reduce the risk.

The largest problem of carbon markets today is that the price of carbon is highly volatile because it depends, as in any other open market, on demand and supply. The different policies implemented in each carbon market make it difficult to have one congruent and world-wide "manual". Not all companies are subject to emission reduction regulations because not all countries have a carbon market or the same standards of regulation of the matter.

**Performance barrier**

Another reason it is difficult to establish and successfully run forest carbon projects is that communities will prefer engaging in other activities that are more profitable than REDD+ activities. Deforestation for the sale of timber generates greater and more immediate income for communities located in forest areas. Agricultural plantations and cattle also provide a higher source of income. If communities do not see that they directly benefit from REDD+ activities and other activities while maintaining the forest areas, they simply will not get on board, because for many it is a matter of survival.

Cutting down trees is easier, quicker and more profitable than protecting and maintaining the forest through

REDD+ activities. Therefore it is necessary to find a way of addressing deforestation by providing the right incentives for forest conservation. Deforestation is a short term strategy that only brings profits for a couple of years. Once the land is degraded, new portions of forests need to be found for deforestation activities. This is a vicious circle that will ultimately decrease the well-being of communities.

## 7. Conclusions and the way forward

The analysis of the eight different case projects shows that many of them need to improve their financial structure in order to reduce the high risk that investors perceive and to ensure long-term funding. The majority of the projects relies on grants, or is only viable if emission reductions can be sold. It is highly recommended that forest carbon projects diversify their activity portfolios and thereby their revenue sources. This would considerably improve their financial sustainability in the short and long term.

Government can play a major role in decreasing the risk perception of the investors regarding the investment in forest projects and REDD+ at large. An opportunity for decreasing investment related risk is through a national integrated approach which includes cross-sectorial participation and involvement and which delivers a compelling REDD+ strategy which creates an enabling condition for investments. The deforestation problem implies a competition for resources and in this sense countries need to make large efforts to integrate REDD+ policies with those from agriculture, energy and mining, which are competing for natural resources. The intersectorial coordination, vision and goals for REDD+ need to be consistent with the development priorities of a country and should to be very explicit. Otherwise any efforts made by REDD+ initiatives will be undermined by existing policies that provide contradicting incentives. REDD+ should also be linked with national or local land-use planning as to provide additional transparency and certainty of governmental objectives.

It is crucial for REDD+ initiatives to go through a testing phase. This testing phase should enable initiatives to be scaled up at a national level and to help establish financial mechanisms which attract institutional and private investors. These could include specific country budgets, budgets combined with ODA funds and funds from strong administrative institutions such as National Development Banks. The aim of such financial mechanisms is to reduce the risk perceptions of private investors and to attract them to invest in REDD+ initiatives.

Another issue that needs to be improved is the control and the monitoring of REDD+ emission reductions or avoided emissions. The MRV system needs to give strong confidence to investors and ensure that their investment will achieve a reliable result. Consequently, recognized methodologies and procedures need to be established, preferably at the national level as to minimize the cost of MRV. Procedures and control or audit mechanisms should be very clear. This refers not only to the results obtained by the REDD+ initiatives but to how the funds were administrated as well. Many investors are reluctant to give funds to government programmes or initiatives because corruption is generally seen as a main risk factor in many developing countries. If monitoring and control are conducted at a state level instead of a national level, perceptions about corruption could be decreased. Monitoring should however be able to account for local changes as to match finance or payments with good behavioral change. Local control and the creation of accounts for each region or state could increase the transparency and positive incentive of the payment mechanism.

Financing REDD+ continues to be the stumbling block in both international negotiations and at project level. Generating carbon revenues from forest project activities usually requires a much longer period of time than carbon projects from other sectors and it is therefore important that the financial gap between project implementation and issuance of tradable carbon credits is fully accounted for in the business plan or national REDD+ strategies. Moreover, the unstable carbon market and the lack of demand pose serious uncertainty for the viability of REDD+ finance. Funds for implementation and operational costs and the oversupplied carbon market constitute the primary challenges reported by the project developers in this study. Therefore, although revenues from carbon credits might provide an opportunity to attract project financing, they are rarely sufficient in covering all project related costs. As the case projects show, forest carbon projects stand a better chance of long-term operation when they are designed to rely on

revenue from a standard activity as their main source of income, for example agro-forestry. In fact, the proportion of revenue expected from the sale of carbon credits constituted a small share in most of the case projects. However, this also poses a risk if commodity prices drop, as illustrated by Case Project 1 where a large amount of the project revenue was lost due to a fall in the gum price. It is therefore recommendable that national REDD+ strategies identify several viable economic activities that can generate income in order to decrease REDD+ related risks and withstand market instability.

Another prominent issue, already mentioned earlier, is the demand for carbon credits from REDD+ initiatives. All the developing countries' efforts will not be enough if the demand for potential REDD+ credits is not increased. The lack of demand is not giving strong signals or incentives for local entrepreneurs to seriously embark on REDD+ initiatives. An increase in demand can only be achieved through more stringent targets for emission reductions in developed countries or Annex 1 countries under the UNFCCC. For the increased demand to have a positive impact for REDD+ initiatives, the sequestered or avoided emissions from these initiatives need to be accepted, at least to some extent, in emission trading schemes around the world. REDD+ credits should therefore be accepted as a way to offset the emissions.

An option to help offset the weak demand for carbon credits in the global market is the creation of regional or national carbon markets. In fact many developing countries are already generating their own national emission trading schemes, including the development of the Brazilian regional markets in Sao Paolo and Rio de Janeiro.

Moving forward, REDD+ will need to further invest in developing institutional capacities and strategies that involve the private sector. The lessons-learned of existing forest and forest carbon projects should be integrated into national strategies and programmes.

Public involvement is therefore advantageous as early on in the project phase as possible as government approval will be necessary for a shift from voluntary initiatives towards national/jurisdictional approaches.

Successful investment in activities that strengthen institutional frameworks for forest governance, land tenure rights and community engagement can altogether make REDD+ an increasingly interesting investment object for the private sector. Local communities need to be given the right incentives and, most importantly, need to be able to receive an income that will encourage them to choose REDD+ activities instead of destroying forests for other economic activities. The involvement of both communities and the private sector ultimately drills down to the economic performance of sustainable forest management and REDD+. This is not only a finding of this report but also a key outcome of the UNFCCC negotiations which proclaim "that social and economic development and poverty eradication are the first and overriding priorities of developing countries". If REDD+ strategies are well designed, REDD+ can be a catalyst for increased investments into forests, community income and social and economic development.

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This technical summary draws lessons on finance options and barriers related to project activities from the forest sector. It investigates the economics of implementing forest carbon projects through a number of case studies from Africa, Latin America and Asia, by analyzing real forest and REDD+ investments. The report sets out to advise policymakers, financial sector stakeholders and project developers on how to structure forest carbon project initiatives and implement national REDD+ strategies, especially in relation to attracting private and/or public investments. The report has been funded by the UN-REDD Programme.